26/4/2017 lec د.طـــرد

$$E_\theta = \frac{\omega \mu I_o}{4\pi} \frac{e^{-JBr}}{r} \frac{\sin\theta}{B(1-\cos\theta)} \left(1 - e^{-JBL(1-\cos\theta)}\right)$$

6

$$|E_\theta| = \frac{\omega \mu I_o}{4\pi r} \frac{\sin\theta}{B(1-\cos\theta)} \left|1 - e^{-JBl(1-\cos\theta)}\right|$$

let $\psi = BL(1-\cos\theta)$

$$|1 - e^{-J\psi}| = |1 - (\cos\psi - J\sin\psi)|$$

$$= |(1-\cos\psi) + J\sin\psi|$$

$$= \sqrt{1 - 2\cos\psi + \cos^2\psi + \sin^2\psi}$$

$$= \sqrt{2 - 2\cos\psi}$$

$$\sin^2\frac{\psi}{2} = \frac{1}{2}(1-\cos\psi)$$

$$= \sqrt{2(1-\cos\psi)}$$

$$\therefore (1-\cos\psi) = 2\sin^2$$

$$= \sqrt{2 * 2\sin^2\frac{\psi}{2}}$$

$$= 2\sin\frac{\psi}{2} = \boxed{2\sin\frac{BL}{2}(1-\cos\theta)}$$ #

$$|E_\theta| = \frac{\omega \mu I_o}{4\pi r} \sin\theta \frac{2\sin\frac{Bl}{2}(1-\cos\theta)}{B(1-\cos\theta)} * \frac{\frac{l}{2}}{l/2}$$

Sa, sin الزاوية / الزاوية

$$|E_\theta| = \frac{\omega \mu I_o l}{4\pi r} \sin\theta \frac{\sin\frac{Bl}{2}(1-\cos\theta)}{\frac{Bl}{2}(1-\cos\theta)}$$

$$|E_\theta| = \frac{\omega \mu I_o l}{4\pi r} \sin\theta \; Sa\left(\frac{\beta l}{2}(1-\cos\theta)\right)$$

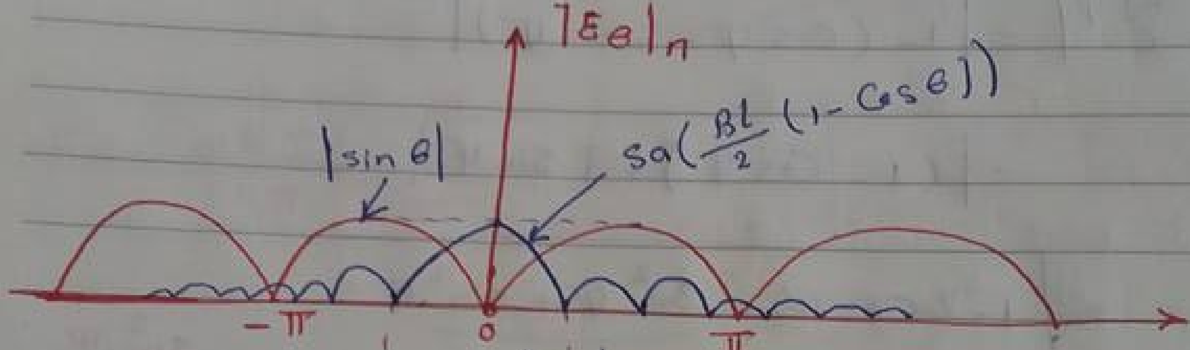
عامل ضرب والمنسب

وجود الـ Sin سبب مشكلة كبيرة في شكل الاشعاع الى طالع

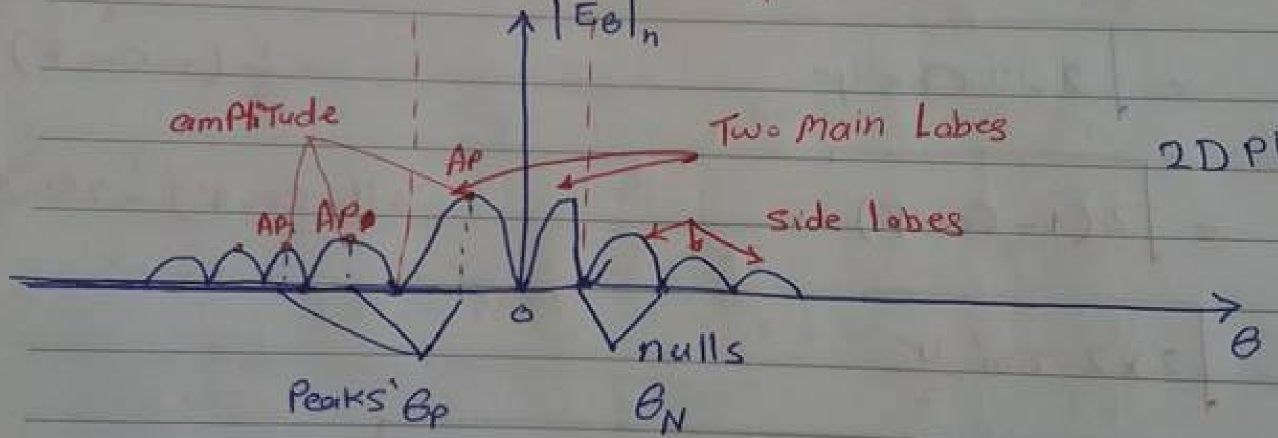
هذه Travelling wave antenna

فصل الـ Magnitude

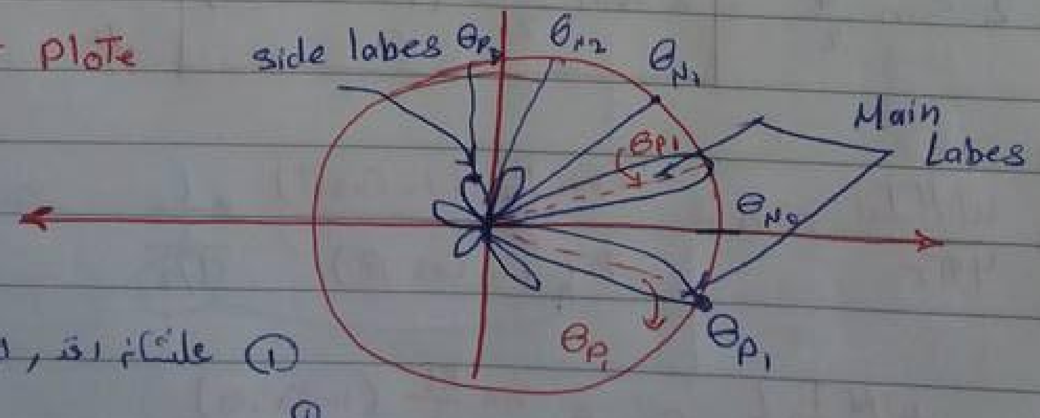
$$|E_\theta|_{normalize} = \sin\theta \cdot Sa\left(\frac{\beta l}{2}(1-\cos\theta)\right)$$



2D PloTe



* Polar PloTe



① علشان اقدر ارسم الرسم ده

①

* To PloTe This PaTTern We MusT determine

[1] location of nulls θ_N

[2] location of Peaks θ_P

[3] amplitudes AP_N

---

* AdVanTage of TWA :

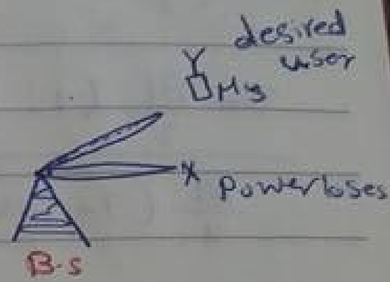
[1] very High gain and directiviTY

---

* disadvanTage

[1] require large area

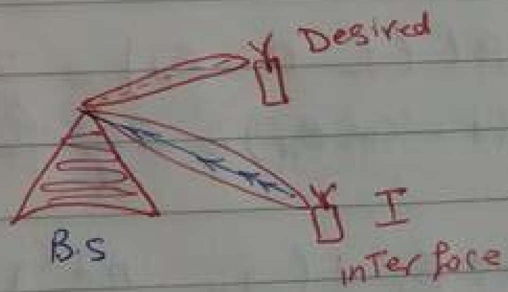
[2] iT has Two <u>Main labes</u>



ارسال

(1) in Case of Transmission
iT Causes a source of Power loss

(2) in Case of recePTion iT
Causes a source of
interference.



* سؤال ليه الـ directive تباعن TWA عاليه

*
location

location of Nulls :→

$$|E_\theta| = \underset{\text{nulls}}{\sin\theta} \cdot \underset{\text{nulls}}{Sa}\left(\frac{\beta l}{2}(1-\cos\theta)\right)$$

for, $\sin\theta_N = 0$ accure of $\boxed{\theta_N = n\pi}$ $\boxed{n = 0}$, 1, 2, 3 ...

$$\rightarrow Sa\left(\frac{\beta l}{2}(1-\cos\theta_N)\right) = 0$$

$$\frac{\overset{\rightarrow\, = 0}{\sin\frac{\beta l}{2}(1-\cos\theta_N)}}{\frac{\beta l}{2}(1-\cos\theta_N)} = 0$$

البسط لازم يساوي (0) كدا سا

$$\sin\left(\frac{\beta l}{2}(1-\cos\theta_N)\right) = 0$$

$$\frac{\beta l}{2}(1-\cos\theta_N) = n\pi$$

$$\beta l(1-\cos\theta_N) = 2n\pi$$

$$(1-\cos\theta_N) = \frac{2n\pi}{\beta l} = \frac{2n\pi}{2\pi}\frac{\lambda}{l} = \frac{n\lambda}{l}$$

$$\cos\theta_N = \left(1 - \frac{n\lambda}{l}\right)$$

$$\theta_N = \cos^{-1}\left(1 - \frac{\overset{\rightarrow *2}{n\lambda}}{\underset{\rightarrow *2}{l}}\right) \quad \overset{Sa}{\boxed{n = 1}}, 2, 3, 4, 5, \ldots$$

لأن دالة الـ Sa مكنش الصفر = 1

let $k = 2n$ في حالة التعويض عن n = 1, 2, 3, 4

$k = 2, 4, 6, 8, 10, \ldots$ $\boxed{\text{even}}$

$$\theta_N = \cos^{-1}\left(1 - \frac{2n\lambda}{2l}\right)$$

$$\theta_N = \cos^{-1}\left(1 - \frac{K\lambda}{2l}\right) \qquad K = \boxed{0}, 2, 4, 6, 8, \ldots$$

sin

عدد زوجي

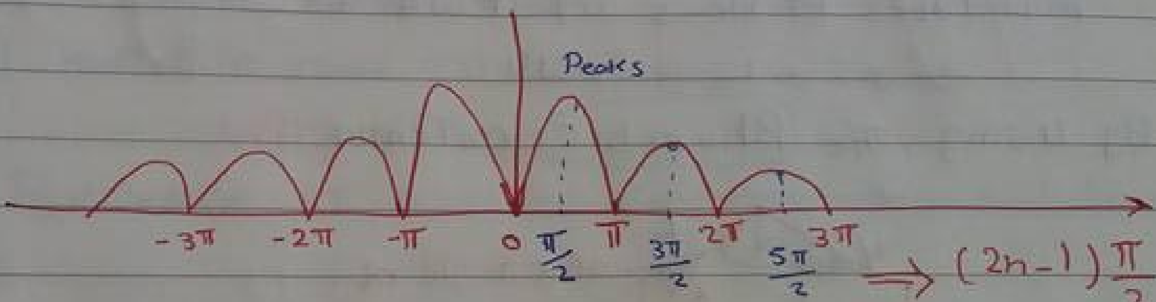
* لو $4\lambda = l$

$$\theta_N = \cos^{-1}\left(1 - \frac{K\lambda}{2 * 4\lambda}\right)$$

احسب الـ nulls [8]

احسب Peaks 8 — احسب العدد اللي ظهر فت # على حسب

اذا كان 8 او 16



$$\Rightarrow (2n-1)\frac{\pi}{2}$$

$$Sa\left(\frac{\beta l}{2}(1 - \cos\theta_p)\right) = Max$$

$$\frac{\beta l}{2}(1 - \cos\theta_p) = (2n-1)\frac{\pi}{2} \qquad n = 1, 2, 3, 4, \ldots$$

$$(1 - \cos\theta_p) = (2n-1)\pi \frac{\lambda}{2\pi \cdot l}$$

$$(1 - \cos\theta_p) = \frac{(2n-1)\lambda}{2l}$$

$$\cos\theta_p = 1 - \frac{(2n-1)\lambda}{2l}$$

$$\theta_p = \cos^{-1}\left(1 - \frac{(2n-1)\lambda}{2l}\right) \qquad n = 1, 2, 3, \ldots$$

let $K = (2n-1) = 1, 3, 7, \ldots$ odd

$$\theta_p = \cos^{-1}\left(1 - \frac{K\lambda}{2l}\right) \qquad K = 1, 3, 5, 7, \ldots$$

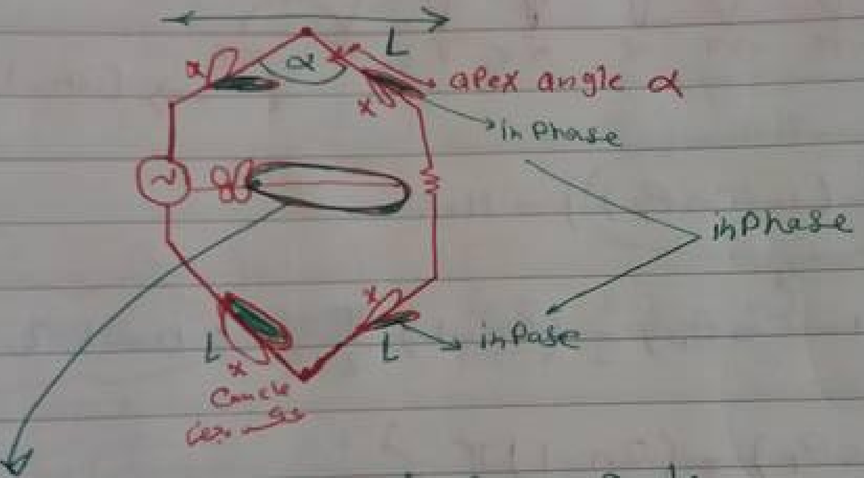
فردي

$$AP_N = \frac{\sin \theta_p}{1 - \cos \theta_p}$$

→ Amplitude

* How To solve The Two main lobes Problems of TWA ?? كيف حل مشكلة 2 Main lobes

- الحل انتينا لها شكل معين
- By using The (Rhombic) anTenna



* Single Main lobes of $\theta = 0$ angle

disadvantage لكن

lost $\frac{1}{2}$ Power

$$\alpha = 2 \sin^{-1}\left(1 - \frac{\lambda}{2l}\right)$$

↳ To Design . Rhombic anTenna

علشان اصمم ع TWA بنحسب الـ α

عند زاوية معينة يحصل Cancle